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IPv6 in 2025: Quo Vadis?

Alexandros Kosiaris

2001:0db8:85a3:0000:0000:8a2e:370g:7334

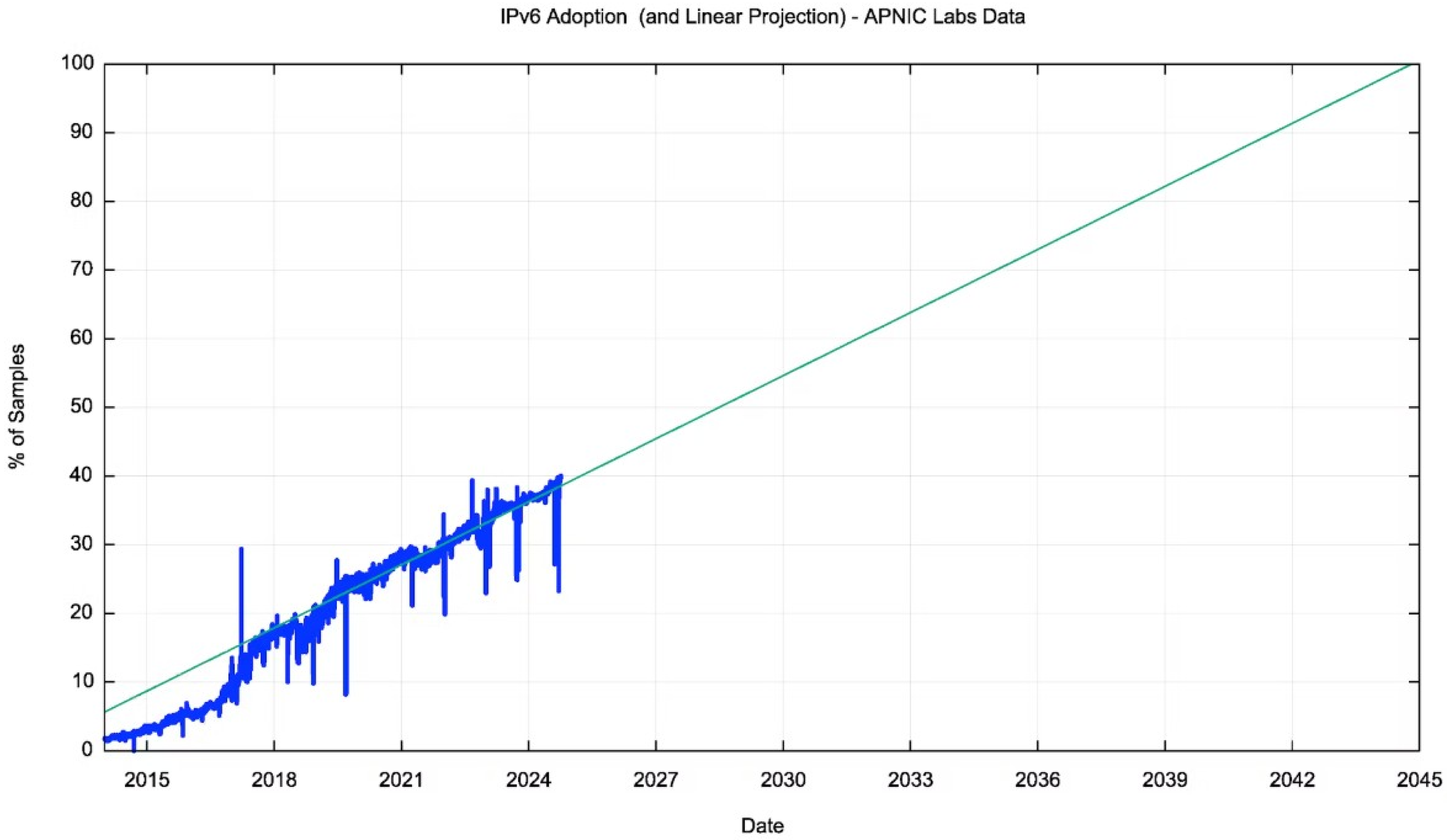
SREcon 2025

WIKIPEDIA
The Free Encyclopedia

Who is Wikimedia?

But NOT just Wikipedia

Can you access Wikipedia over IPv6?



Credits: Geoff Huston, https://www.potaroo.net/ispcol/2024-10/ipv6-transition.html

What's up with IPv6 in 2025?

The good!

Let's talk about some new developments

Some happy reminders

- Android and iOS operate fine in IPv6-only environments since 2014
- T-Mobile in the US is IPv6-only since 2014
  - How? 464XLAT (CLAT/PLAT), translation mechanisms
- Facebook, Microsoft, and Google have been running parts of their corporate and production networks as IPv6 only for years (since 2017 at least)
- More* people connecting to Google over IPv6 than IPv4
- Some countries have more IPv6 users than IPv4: US, GR, DE, FR, IN, UK, JP, BR

Windows

Starting with Windows 11, there are plans to:

- Expand CLAT to non-cellular network interfaces
  - RFC 7050 - ipv4only.arpa DNS query
  - RFC 8781 - PREF64 option in RAs
  - RFC 8925 - DHCP Option 108 - aka IPv6-only preferred

https://techcommunity.microsoft.com/blog/networkingblog/windows-11-plans-to-expand-clat-support/4078173

Linux

- CLAT implementing patches have been posted to NetworkManager (Jan 2025)
- NetworkManager 1.52 (Feb 2025) has support for DHCP option 108
- IPv6OnlyMode (DHCP option 108) added in systemd 255 (Dec 2023)
- Efforts to put in the mainline kernel proper CLAT support

https://gitlab.freedesktop.org/NetworkManager/NetworkManager/-/merge_requests/2107

macOS

- Starting with version 12.0.1, supports DHCP option 108
- Starting with Ventura (2022) has CLAT support

Android

- DHCPv6 prefix delegation support is coming out via Google Play System Updates (by end of 2025)
- Thread Networks, Wearables, Tethered devices, VMs will be able to grab IPv6

https://android-developers.googleblog.com/2025/09/simplifying-advanced-networking-with.html

Progress on getting shipwrecked sailors to adopt ICMPv6 has been slow

The bad?

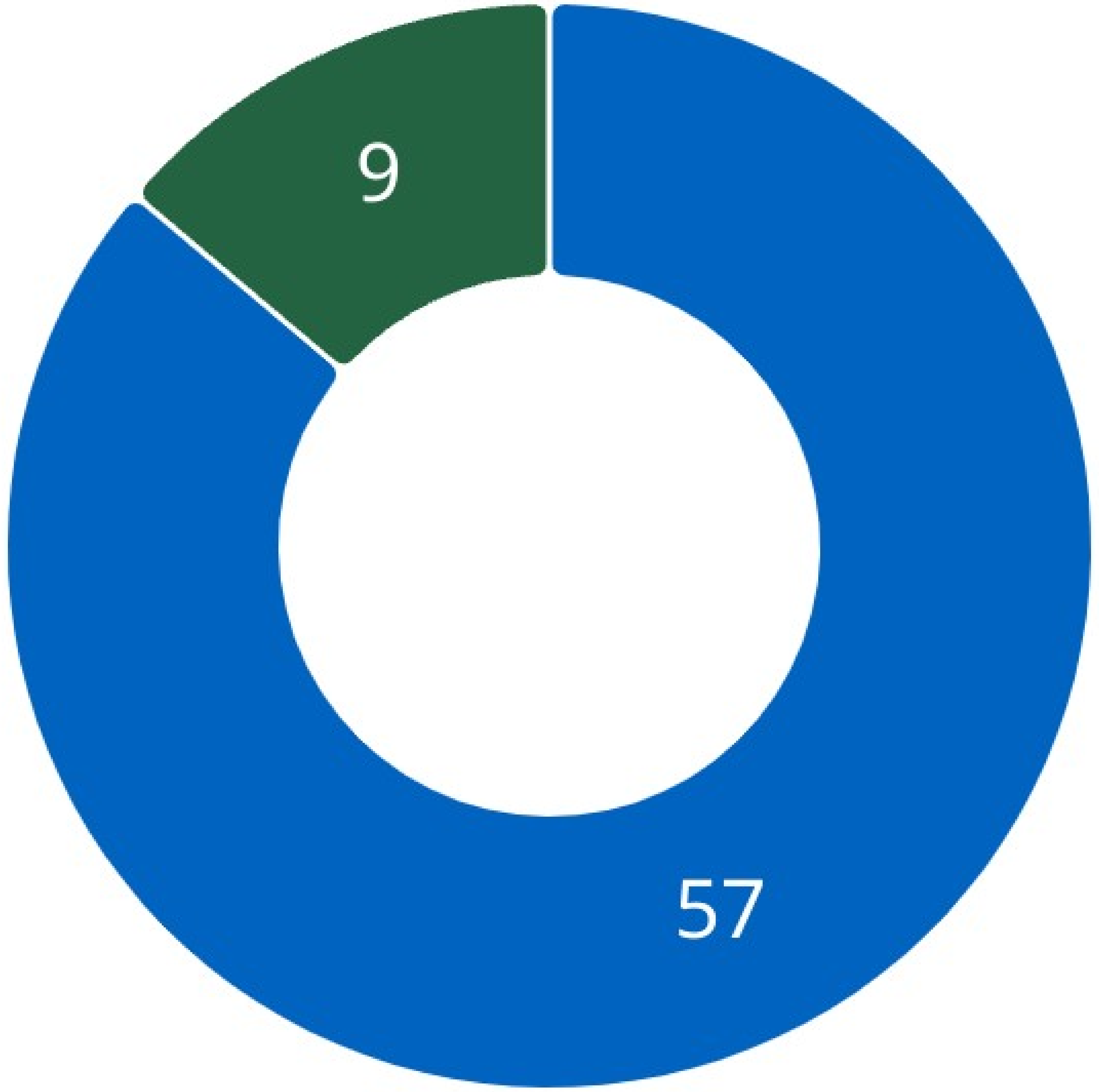
IPv6 isn't going away!

However

Is IPv6 a second class citizen?

Instructions

Test run: Which conference is this?



0	Devops days	×
57	SREcon 2025	✓
0	Web3.0con-🤮	×
9	SREcon 2026-ipv6-only	✓

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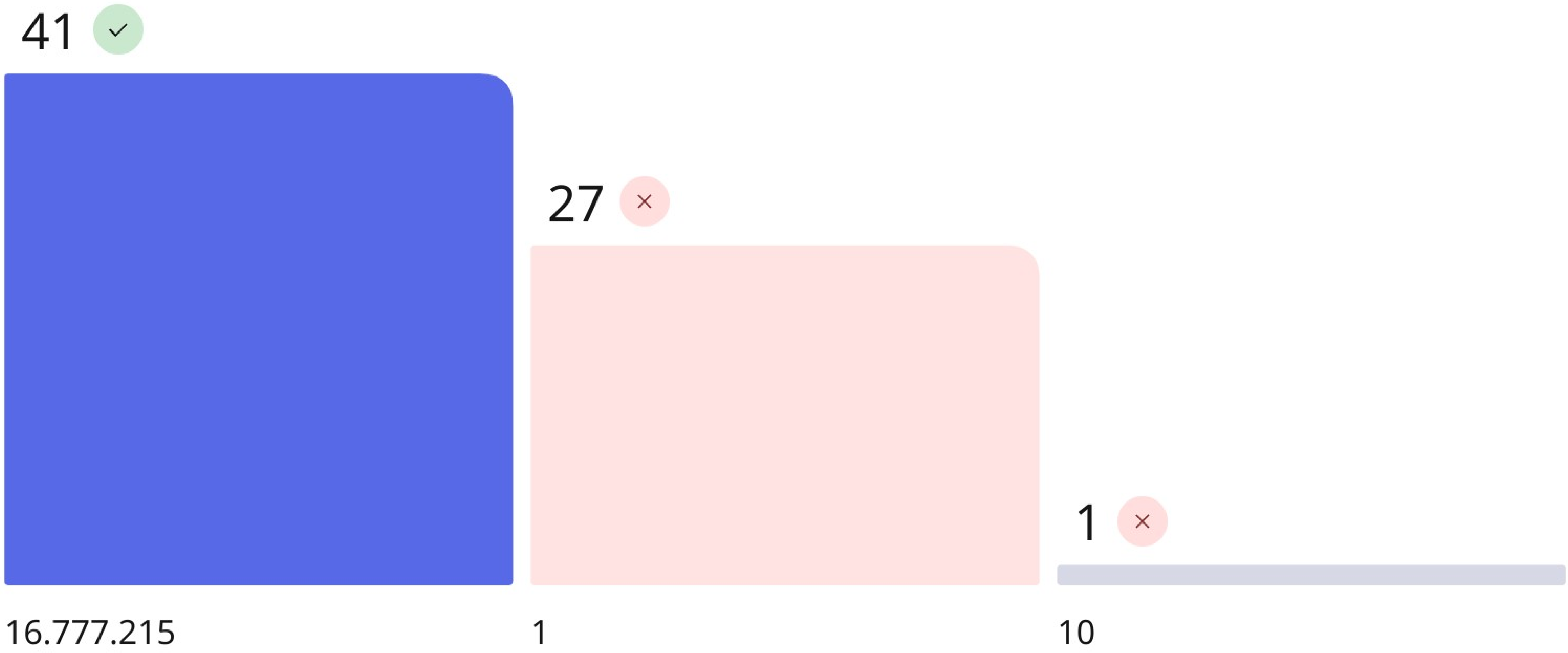
How many IPv4 loopback addresses exist?



How many IPv6 loopback addresses exist?

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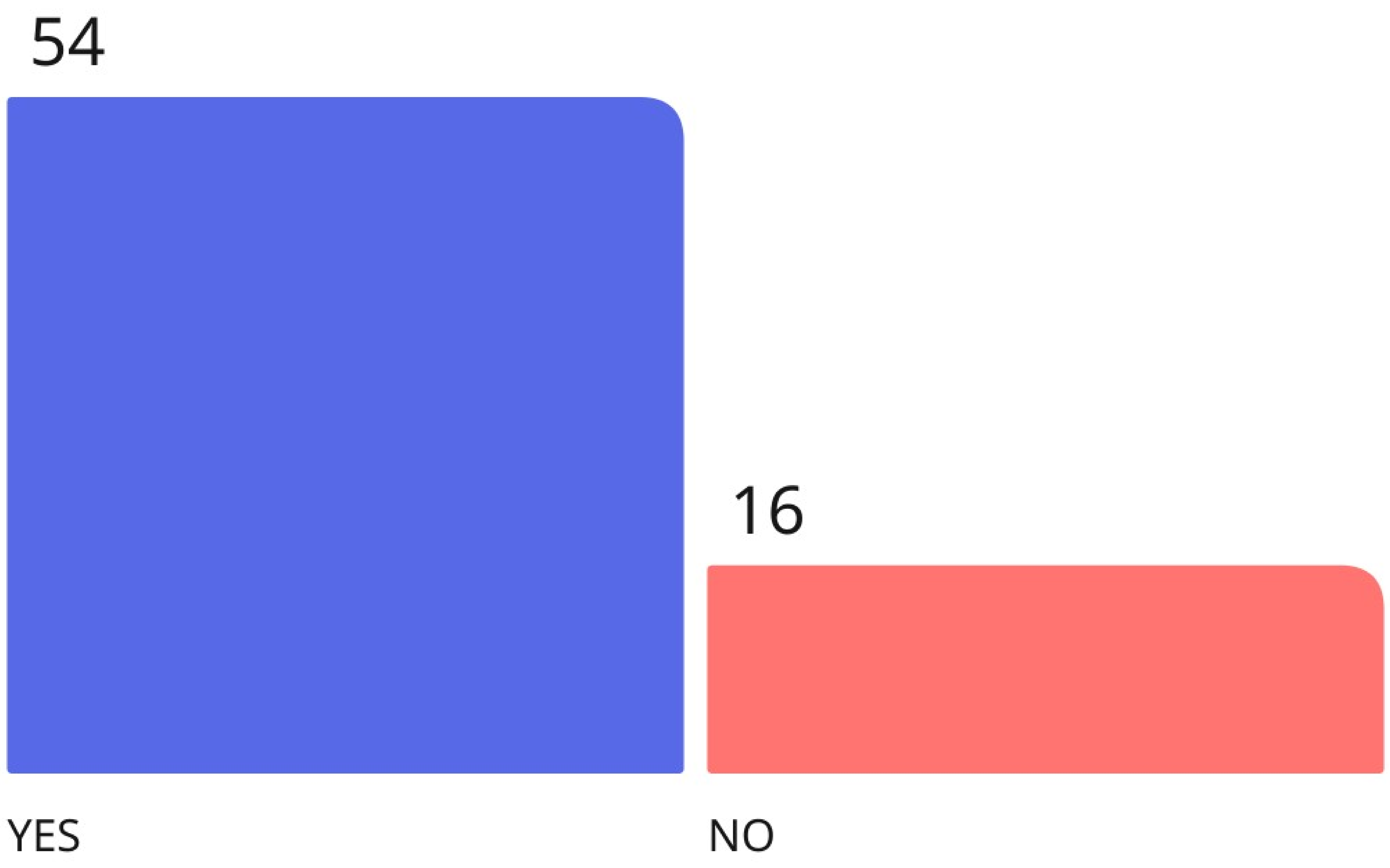
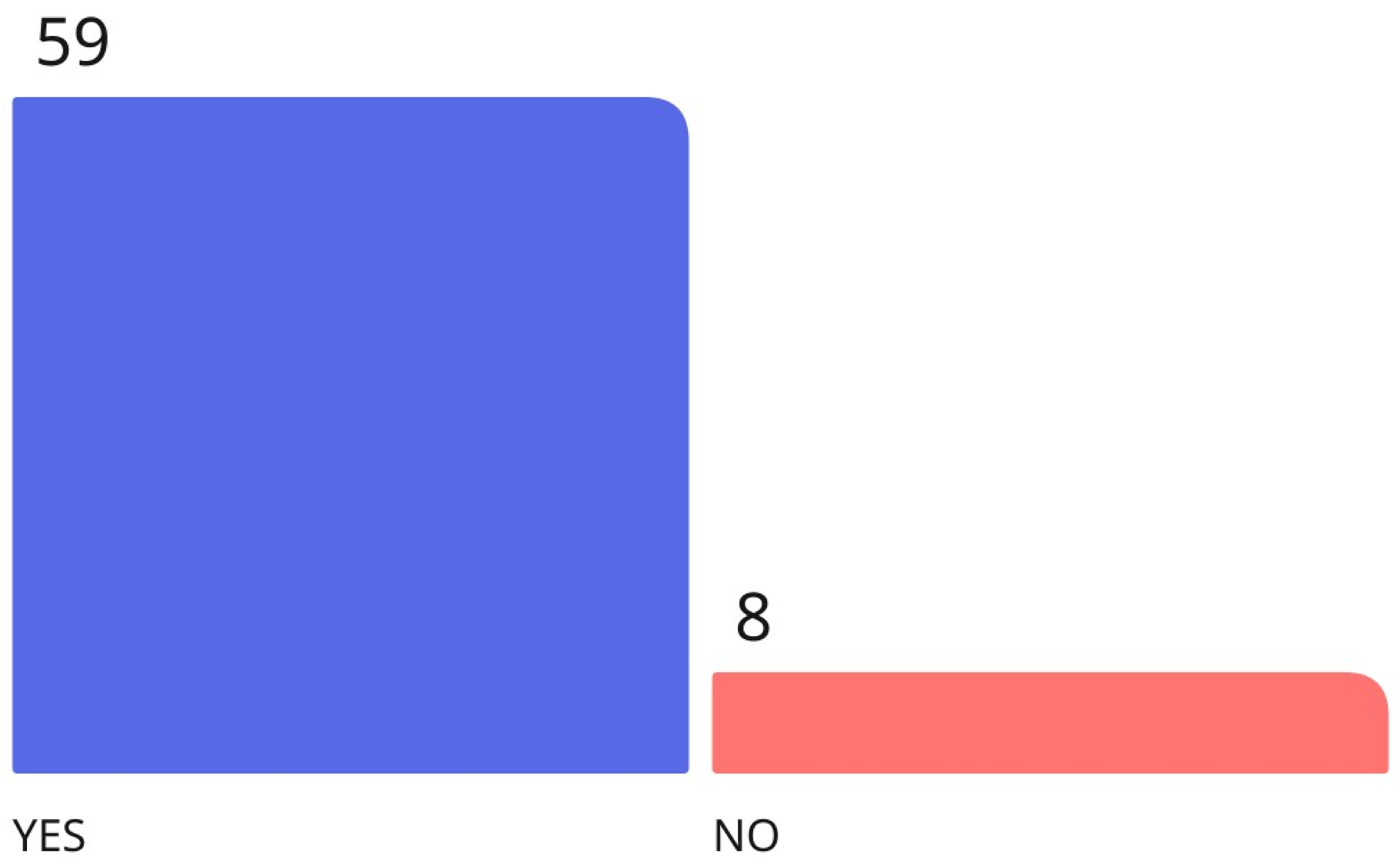
How many IPv6 addresses does a typical interface have?

In the last 12 months, I 've configured a network enabled device



And I looked to see what IPv4 address it had



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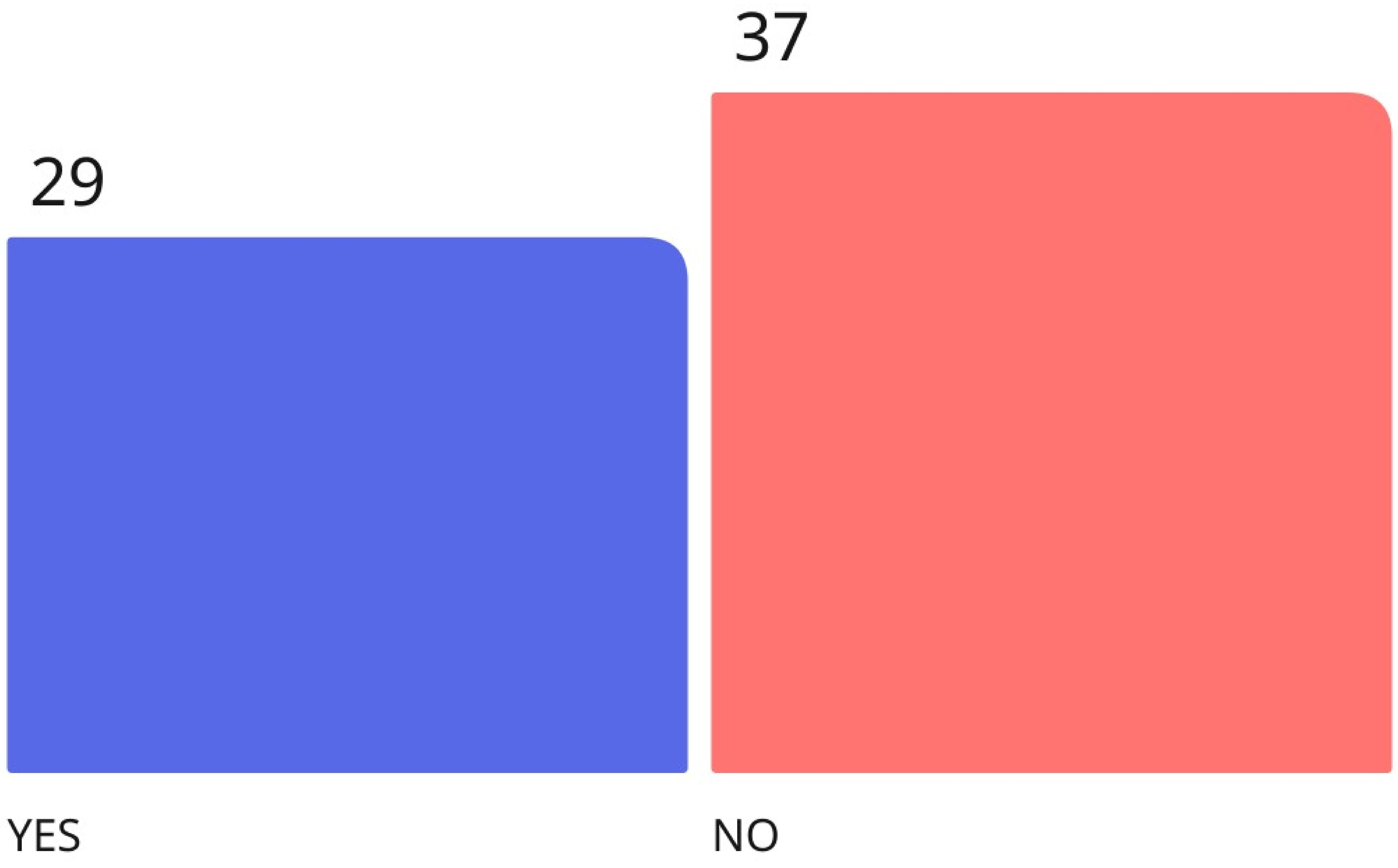
And I looked to see what IPv6 address it had



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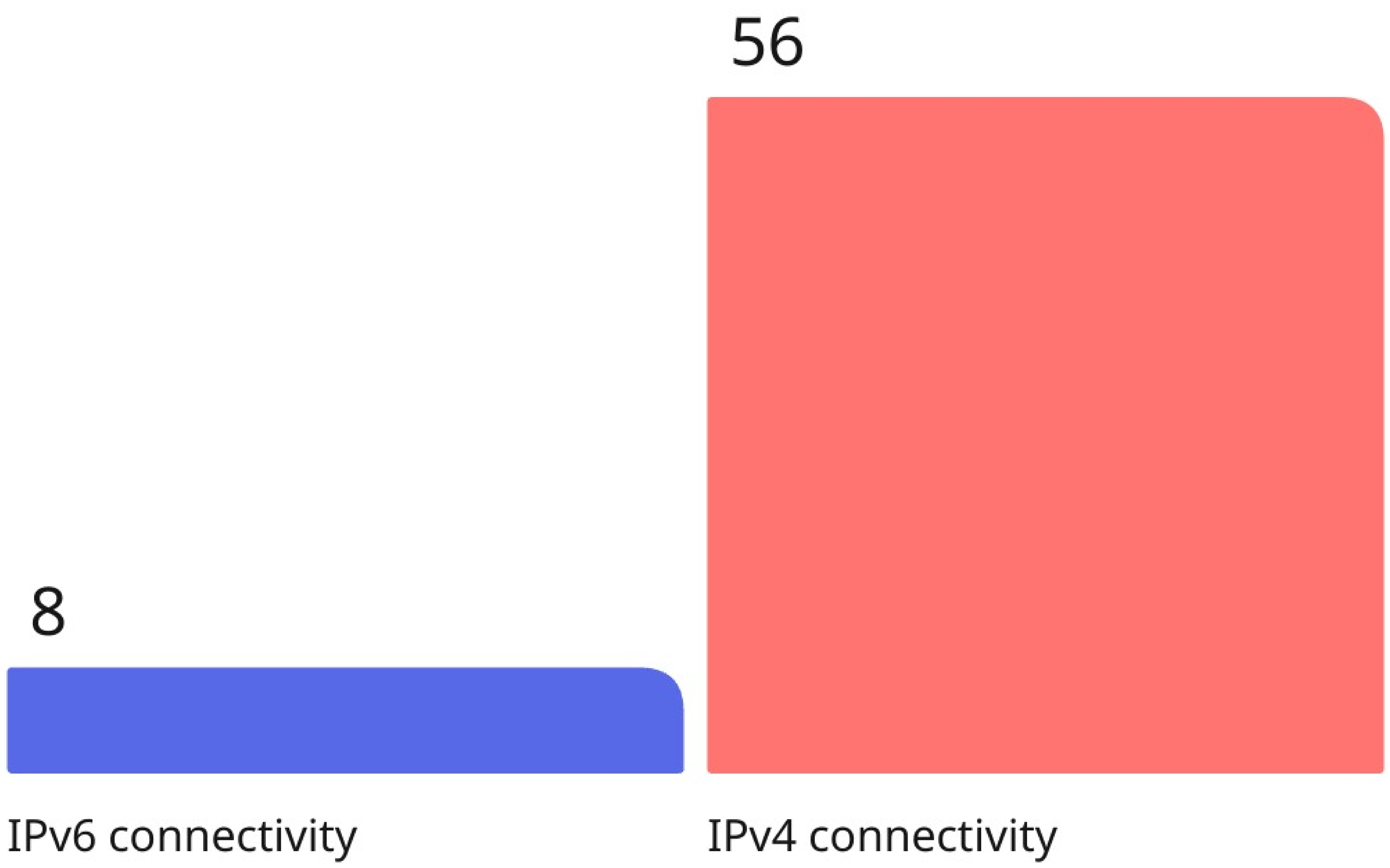
I had to debug connectivity. I FIRST looked at:



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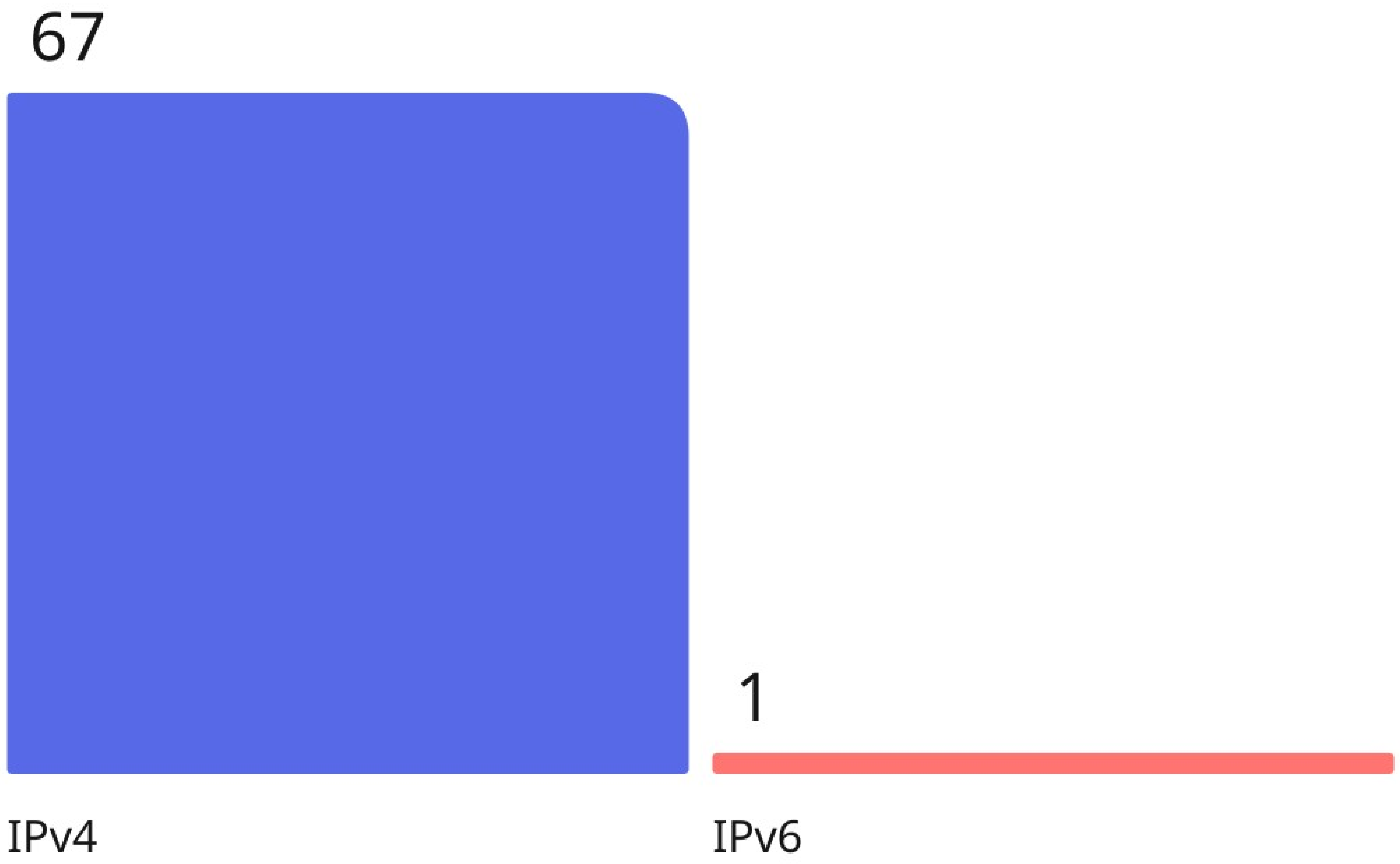
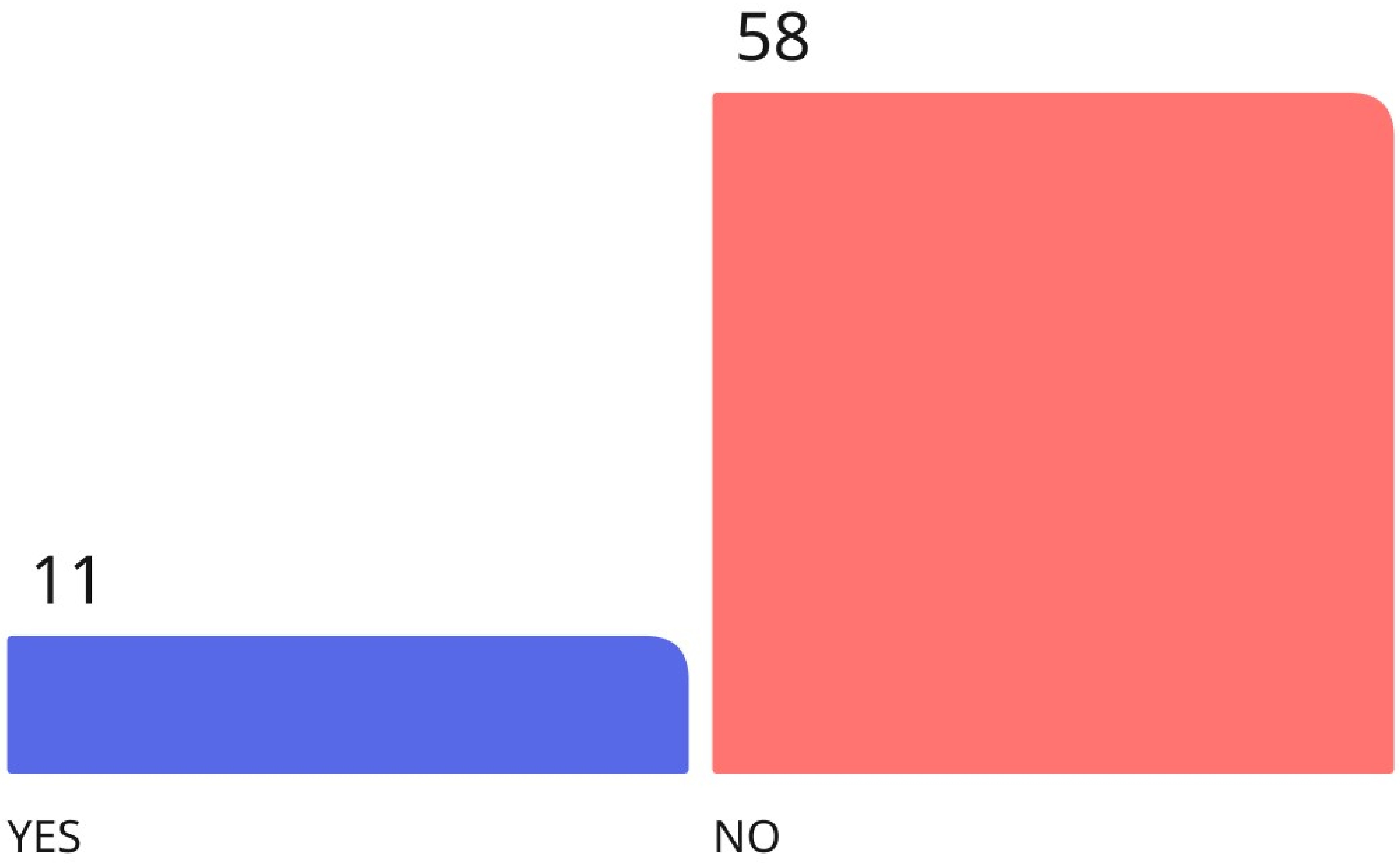
It was DNS (surprise!). I pinged the .... address of a DNS Server



I did notice the WRONG IPv6 address at the very first slide



13
69

The ugly?

The Cloud part?

Not so much anymore

GCP

- Compute ✔️
- Networking ✔️
- Load Balancing ✔️
- DNS ✔️
- Application services 23/29 🙂

But …

☹️ IPv6 functionality is available only in Premium Tier ☹️

https://cloud.google.com/vpc/docs/ipv6-support

3

Azure

- Compute ✔️
  - IPv6-only ❌
- Networking ✔️
  - Firewalls 🥴
- Load Balancing ✔️
- DNS ✔️
- Containers ❌
- PostgreSQL ❌

💸However: No charge! 💸

https://learn.microsoft.com/en-us/azure/virtual-network/ip-services/ipv6-overview

AWS

- Compute ✔️
- Networking ✔️
- Load Balancing 🥴
- DNS ✔️
- Overall:
  - Dual Stack Support 122/128 (aka 95.31%) with 3/128 Partial ✔️
  - IPv6-only 34/128 (26.56%) with 3/128 Partial ❌
  - Public Endpoints 114/128 (89.06%) with 1/128 Partial ✔️
  - Private Endpoints: 87/128 (67.97%) with 12/128, no PrivateLink integration 😐

https://docs.aws.amazon.com/vpc/latest/userguide/aws-ipv6-support.html

What about the other clouds?

What about On Premises?

General rules

- Start small
- Get a good IPAM
    - Your mind and your notes aren't gonna cut it
- **Automate network provisioning and configuration**
    - Especially fire-walling rules!
- **Automate server network provisioning and configuration**
- Establish rules
    - e.g. IPv4 **A.B.C.D** ? => IPv6 2620:0:861:4:**A:B:C:D**
- If you can avoid Dual Stack, AVOID IT!
    - Easier said than done

1

Kubernetes

- Did NOT add IPv6 until 2019
- First alpha in 1.16
- In 1.23 IPv4/IPv6 dual-stack is stable.

What issues did we meet?

- Having to duplicate our Envoy configuration
- Having to deal with IPv4 mapped IPv6 mapped address sucks
- Node.js 17.0 reversed IPv6 treatment and finally DTRT
- Forgotten fire-walling rules that only opened IPv4 hole
- "Surprises" by new clusters being IPv6 enabled
- Few incentives to adopt IPv6 more

1

IPv6-only related questions plz!

4